RESEARCH

Cariboo Forest Region

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EXTENSION NOTE #15
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Natural and Managed Disturbance Patterns: Implications for Biodiversity Management in the Interior Douglas-fir Zone

RESEARCH ISSUE GROUPS

- **Soil Conservation**
- **Wildlife Habitat**
- **Hydrology**
- **Forest Health**
- **Reforestation**
- **Stand Tending**
- **Ecosystem Inventory and Classification**
- **Biodiversity**
- **Guideline Verification**
- **Extension**

Maintaining biodiversity is an important aspect of forest management. *Biodiversity* refers to the variety and processes of life at all levels, from genes and species to populations and ecosystems. Forest resource managers need sound ecological information for designing and selecting management options to maintain biodiversity while achieving other management objectives.

A widely accepted approach to conserving natural biodiversity within managed forests is to maintain important attributes of natural forests within managed forests. In this approach, special attention is given to understanding natural disturbances, such as wildfires, insect outbreaks, and natural blowdown, and designing management regimes with similar effects. The current diversity of living systems has been influenced by natural disturbances and, as a result, management practices with similar effects may have the greatest potential to maintain natural biodiversity.

Natural forest attributes considered in this approach include landscape level and stand level attributes. Landscape level attributes include the abundance, distribution, and relationships of landscape elements (stands or habitats) within a designated landscape area (commonly 10,000 to 60,000 ha). The stand level component of the approach looks within the landscape elements and considers their structure, function and local dynamics.

This Extension Note outlines a four-year study by Forest Sciences to describe landscape and stand level attributes within a 2000 km^2 portion of the IDFdk3. The purpose is to help develop management guidelines to maintain natural biodiversity in managed landscapes of the IDFdk3.

OBJECTIVES

This project was initiated to:

- document stand and landscape level attributes of the IDFdk3 on both naturally disturbed and managed landscapes,
- compare differences between natural and managed landscapes,
- evaluate the implications of these differences to the maintenance of biodiversity, and
- recommend management practices to maintain biodiversity in managed stands.

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PROJECT LOCATION

The study area is within the IDFdk3 biogeoclimatic subzone, which occupies the level to gently rolling, low elevation plateau east of the Fraser River in the Cariboo Forest Region.

PROJECT COMPONENTS

There are four main components to this biodiversity study:

LANDSCAPE ANALYSES

Attributes of a 2000 km^2 area, encompassing thirteen 1:20,000 scale forest inventory mapsheets, were analysed with PAMAP GIS. Forested landscape elements were defined using overstory species, age and crown closure from the most recent forest inventory data base. The composition and spatial arrangement of these elements are being analyzed for both the current landscape and for a model of the "pre-industrial" landscape. The "pre-industrial" landscape was reconstructed using assumptions about the type of forest that existed in harvested areas prior to logging, excluding the effect of fire control.

STAND SAMPLING

Stand attributes were measured in 55 stands sampled in the summer of 1993. The stands included a range of management regimes (such as clearcutting, juvenile spacing and various levels of selection harvesting) and successional stages found within the IDFdk3.

The study compares several natural and managed stand attributes to provide a better understanding of how forest management practices change these attributes, and some guidance on how to refine management practices to maintain natural biodiversity. Various levels and combinations of these attributes provide a diverse array of habitats for the biological community.

BIOLOGICAL DIVERSITY

A 1993 pilot study examined habitat use by breeding birds in old growth and selection harvested Douglas-fir forests. Although total bird density and indices of species diversity did not differ significantly between the two forest types, a shift in species composition was observed. Some species used both habitat types, while others showed a preference for one or the other.

Breeding bird surveys will be expanded in 1994 to include a larger geographic area, a broader range of harvesting and stand tending treatments, and some exploration of landscape factors. Other biological diversity components will be examined in subsequent years.

BIODIVERSITY IMPLICATIONS AND GUIDELINE DEVELOPMENT

This phase of the project will integrate analyses from the first three phases with information from other sources to evaluate current management practices and develop options for maintaining biodiversity in managed IDFdk3 forests.

END PRODUCTS

The project will produce:

- a **methodology** for analyzing attributes important for biodiversity management
- an **information baseline** on natural stands and landscapes and how current management practices are changing them
- **management recommendations** for biodiversity conservation

CONTACTS

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SOME STAND AND LANDSCAPE BIODIVERSITY ATTRIBUTES IN IDFdk3

Coarse Woody Debris - When they fall over and decompose, trees continue to provide important ecosystem functions, such as nutrient cycling, moisture storage, and habitats for invertebrates, amphibians, mammals and birds. Logs in advanced stages of decay can provide ideal sites for regeneration of some conifer species.

Large trees - Large, old trees can provide habitat niches not provided by younger, smaller trees. For example, the thick furrowed bark of large Douglas-fir trees provides roosting sites for bats. the foliage forms the major part of mule deer winter diets and is strongly preferred by deer over foliage from younger trees.

Arboreal Lichen - Many species of lichens grow on trees in IDF forests. Arboreal lichens provide food for mule deer and flying squirrels, nesting material for numerous bird species, and habitat for many small invertebrates.

Snags - Dead standing trees provide homes for a wide variety of animals that nest in tree cavities. These animals, in turn, provide important ecosystem functions, such as the control of bark beetle populations by woodpeckers and the distribution of mycorrhizal fungi spores by flying squirrels.

Understory Vegetation - The pattern, composition and vigour of the understory plant community are highly influenced by the nature of the forest canopy. These vegetation characteristics strongly influence the other parts of the biological community, from soil organisms to mammals and birds.

Forest Canopy Structure - Interior Douglas-fir stands typically include trees of different sizes and ages resulting from frequent light burns and dispersed tree mortality. This complex structure provides a variety of adjacent terrestrial and arboreal habitat components.

Landscape Composition - Forest landscapes are composed of a mosaic of elements. The size, shape, number, combination and relative dominance of these elements are important attributes of the landscape composition for biodiversity.

Landscape Spatial Arrangement - The arrangement of landscape elements influences the ability of organisms to move across the landscape to fulfill their life requirements. Examples for animals include seasonal migrations and daily movements to avoid predation or access various food resources. Examples for plants and fungi are pollination and dispersal of seeds and spores. Spatial arrangements that allow organisms to move throughout the landscape (often called *connectivity*) are critical to landscape design for biodiversity.